

the IPER, all of the claims possess novelty and inventive step (nonobviousness), particularly in view of the failure of these references to disclose or suggest the characteristic feature of claim 1 (the only independent claim in the present application) “wherein the system after the reaction is gradually cooled at an average cooling speed of 0.2 to 1.0 °C/min. selectively in a temperature range of maximum system-viscosity temperature ± 1 °C.” Applicants note that because of this characteristic feature of the present invention, the claimed process provides a PAS (polyarylene sulfide) having improved powder processability (i.e., a large bulk density) while effectively shortening the cooling step, as clearly demonstrated in Tables 1 and 2 at pages 31 and 32 of the instant application.

The rejection of claims 1-33 under 35 U.S.C. §102(b) or 35 U.S.C. §103(a) based on EP 0 436 120 (EP ‘120) is respectfully traversed.

EP ‘120 discloses a cooling process after the reaction for formation of polyarylene sulfide (in Example 1) including two times of quenching by addition of a separation agent (i.e. NMP and water) and intermediate cooling at a rate of 0.5 °C/min. over a wide temperature range of 185 °C to 153 °C (already requiring 64 min. (=32 °C/(0.5 °C/min.) for the intermediate cooling period).

Thus, EP ‘120 fails to disclose or suggest the characteristic feature in present Claim 1 “wherein the system after the reaction is gradually cooled at an average cooling speed of 0.2 to 1.0 °C/min. selectively in a temperature range of maximum system viscosity temperature ± 1 °C” (i.e., a critically limited narrow temperature region around ca. 230 °C as shown in Table 1). Owing to this feature, the claimed process provides a PAS (polyarylene sulfide) having improved particle properties (i.e., a large bulk density) through a short cooling step (e.g., 30 - 50 min. over a temperature range of 260 °C to 150 °C in Examples 1 and 2) (and also without requiring the addition of a separation agent (water) as a quenching agent as required in EP ‘120), as clearly demonstrated in Tables 1 and 2 at pages 31 and 32 of the instant application. (Incidentally, the meaning of the above underlined passage is further discussed on page 19 and recited in Claim 1.)

The process of EP ‘120 is comparable to Comparative Example 1 of the present application, adopting a slow cooling over a wide temperature range (disclosed in Table 2 at page 32 of the present application) except for the two times of quenching by adding a separation agent.

For these reasons, Applicants take the position that the presently claimed invention is clearly patentable over the EP '120 reference.

The rejection of claims 1-4, 7-11, 15-22, 25-27 and 30-33 under 35 U.S.C. §102(b) or 35 U.S.C. §103(a) based on EP 0 568 366 (EP '366) or Kawakami et al. is respectfully traversed.

These references, which correspond to each other, also disclose a slow cooling rate of 1°C/min. over a full range of cooling after addition of water in Comparative Example 6 (column 15, line 8 of Kawakami et al.; page 11, line 31 of EP '366). The abstract and the disclosure from column 4, line 34 to column 5, line 12 of Kawakami et al., as well as the corresponding disclosure of EP '366 (abstract and page 4, lines 12-40), fail to disclose or suggest a specific cooling rate.

The rejection of claims 1-4, 7-11, 15-22, 25-27 and 30-33 under 35 U.S.C. §102(b) or 35 U.S.C. §103(a) based on Iwasaki et al. is respectfully traversed.

This reference discloses (ii) lowering the temperature of the reaction system and maintaining the reaction system for at least two hours within a temperature range of 220 – 250°C while stirring (column 5, lines 22-25). However, Iwasaki et al. fail to disclose a slow cooling speed in a specifically narrow temperature range.

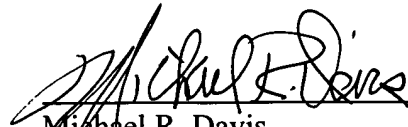
Consequently, as mentioned above, all the cited references fail to disclose or suggest the characteristic feature in Claim 1 “wherein the system after the reaction is gradually cooled at an average cooling speed of 0.2 to 1.0 °C/min. selectively in a temperature range of maximum system viscosity temperature ± 1 °C”. In view of this, all of the claims are directed to subject matter which is clearly patentable over the applied references.

Therefore, in view of the foregoing remarks, it is submitted that each of the grounds of rejection set forth by the Examiner has been overcome, and that the application is in condition for allowance. Such allowance is solicited.

Respectfully submitted,

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